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(56) Documents Cited
GB 2269548 A **GB 2203157 A** **GB 1477658 A**
EP 0036616 A1

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(54) **Fire resistant cladding.**

(57) A cladding board 1, 2, 3, 4, 5 for cladding structural steel members, comprises a layer of thermally insulating fire resistant board material 10 sandwiched between two layers 11, 12 of intumescent material. A structural steel member fitted with a fire-resistant covering, comprises an intumescent adhesive layer 12 bonding the covering material to the steel, a fire-resistant thermally insulating material 10 bonded on one side thereof to the intumescent adhesive material, the thermally insulating material having bonded to an outer surface thereof a layer of intumescent material 11.

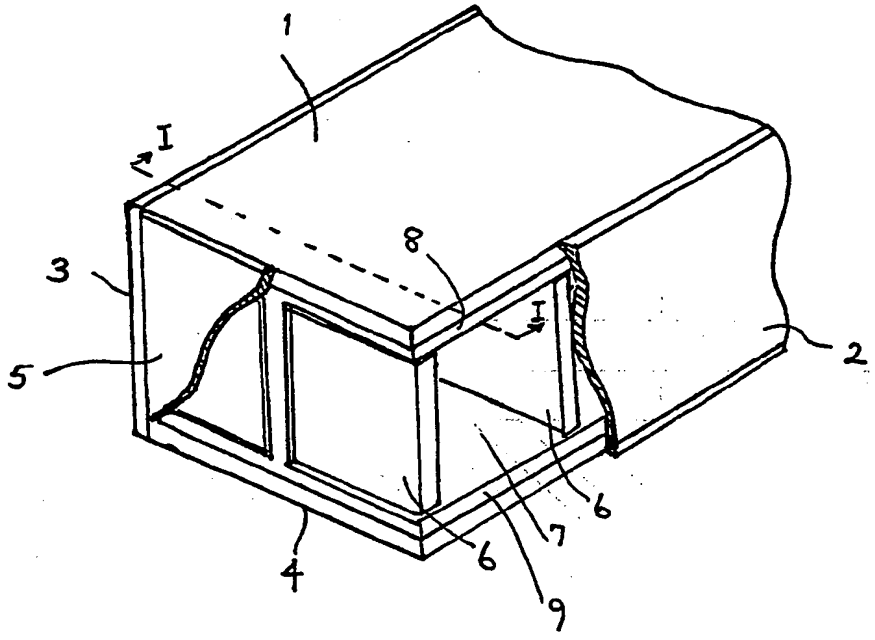

FIG. 1

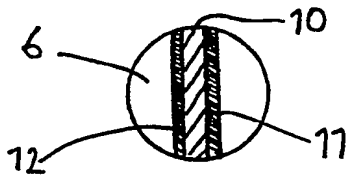

FIG. 4

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The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

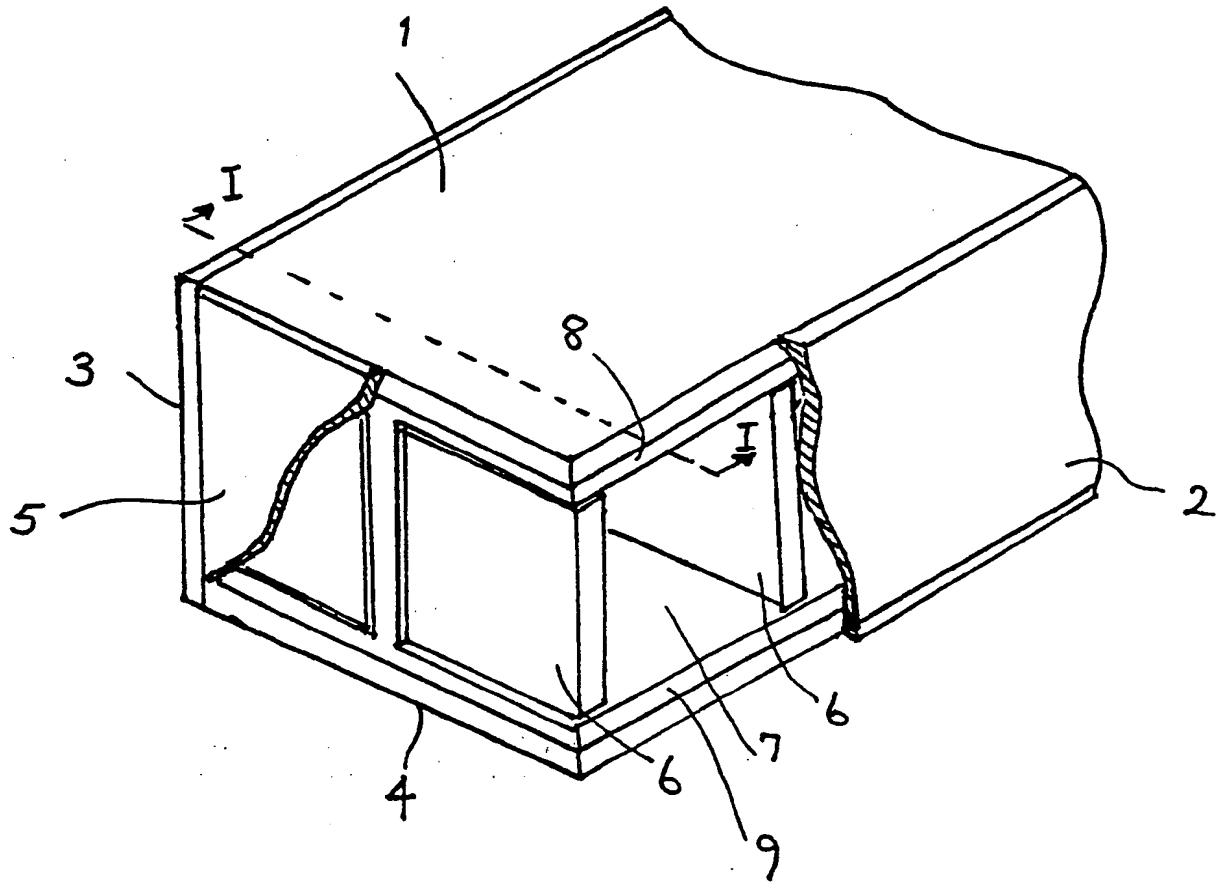

FIG. 1

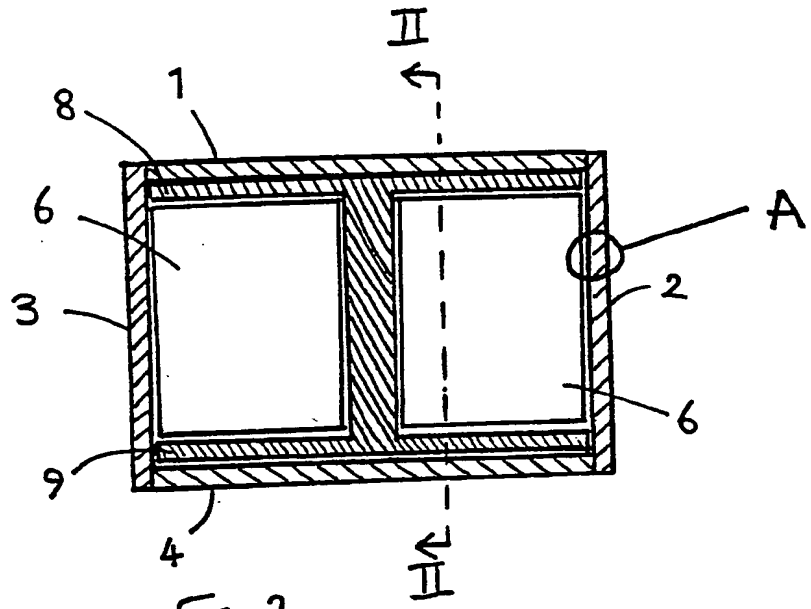

FIG. 2

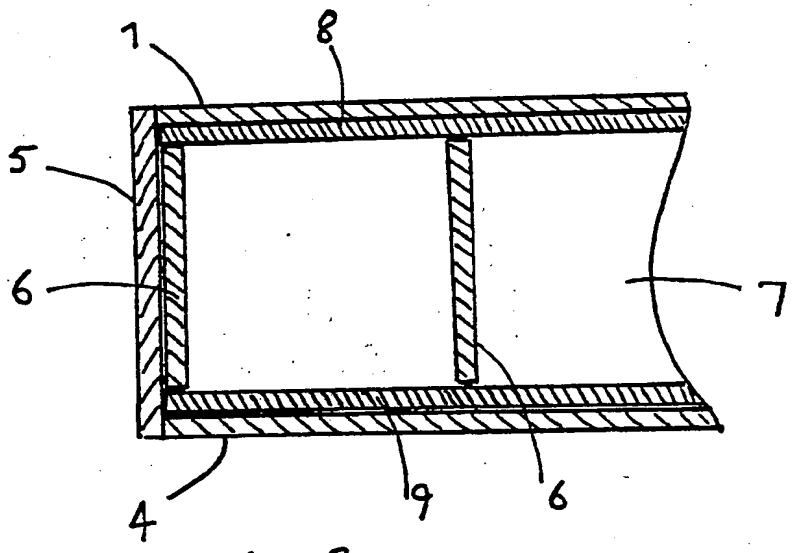

FIG. 3

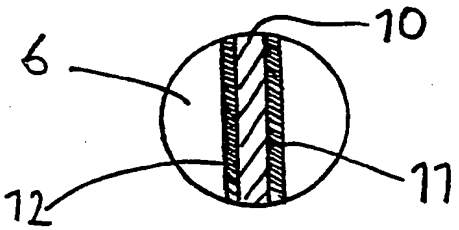

FIG. 4

FIRE RESISTANT CLADDING

This invention relates to fire-resistant cladding materials for structural steel members.

Steel beams, at the temperatures produced in a fire situation, tend to bend and buckle as the temperatures reach 550^0C and above. In order to overcome this problem, it has been known to encase the structural steel members within boxwork constructed from a fire-resistant insulating material such as Rockwool slabs. However, a disadvantage with the use of such materials is that in order to provide the requisite degree of protection, relatively thick sections of Rockwool material are required, for example 10cm thick or more. The thickness of the slab material means that the overall protective structure is somewhat bulky, and this in turn not only detracts from the appearance of the structure but leads to an increase in

installation time, and cost, particularly in view of the need to use mechanical fixing means for securing the cladding materials to the steel. Moreover, there exists the risk that under fire conditions, the mechanical fixings may fail leading to the cladding falling away from the steel beam.

It is an object of the present invention to overcome or at least alleviate the aforementioned problem.

In a first aspect, the present invention provides a cladding board for cladding structural steel members, the material comprising a layer of thermally insulating fire-resistant board material sandwiched between two layers of intumescent material.

The thermally insulating fire-resistant board material can be a ceramic board of known type, or board or slab material formed from Rockwool or similar Man-Made Mineral Fibres (MMMF).

The intumescent material can be in the form of an intumescent strip material bonded to the thermally-insulating fire-resistant board material, or it can be in the form of an intumescent coating which is applied to the board material in liquid form.

The intumescent material can be formed of an intumescent substance such as an alkaline metal silicate, eg. a sodium silicate, or other intumescent substances such as exfoliating graphite.

The intumescent materials typically will contain, in addition to the intumescent substance, a binding agent,

most usually a polymeric binding substance, and in particular an elastomeric binder such as a polyacrylate or derivative thereof, or a polyvinylacetate. Where the intumescent material is provided initially as a solid material which is then bonded to the thermally insulating material, the intumescent material may be a strip material of a type described in our co-pending applications numbers 9224199.1 and 9207659.5 (Publication No. GB 2254609A).

The layer of intumescent material on one side of the thermally insulating fire-resistant board material is formulated to function as an adhesive, by which the cladding material is secured to the steel beam, without the need for additional mechanical fixings. Thus, the said layer is advantageously applied as a liquid, either directly to the steel beam or to the thermally insulating fire-resistant board material prior to fixing of the board material to the steel cladding. The liquid intumescent composition can contain an adhesive resin or mixture of adhesive resins. For example, the liquid composition can comprise an acrylate polymer or a urea-formaldehyde resin dispersion.

In a further aspect, the present invention provides a structural steel member fitted with a fire-resistant covering, the fire-resistant covering comprising an intumescent adhesive layer bonding the covering material to the steel, a fire-resistant thermally insulating material bonded on one side thereof to the intumescent adhesive layer, the thermally insulating material having bonded to

an outer surface thereof a layer of intumescent material.

The present invention also provides a method for protecting a steel structural member, which method comprises securing to the said steel structural member a cladding board comprising a layer of thermally insulating fire-resistant board material sandwiched between two layers of intumescent material, wherein one of said two layers of intumescent material is an adhesive layer for adhering the cladding board to the structural steel member.

One embodiment of the invention will now be described in greater detail by reference to the accompanying Figures 1 to 3 in which:

Figure 1 is an isometric view of an I-beam clad in accordance with the present invention;

Figure 2 is a sectional view along line I-I in Figure 1;

Figure 3 is a sectional view along line II-II in Figure 2; and

Figure 4 is an enlarged view of the portion A marked in Figure 2.

Referring now to the drawings it can be seen that a steel I-beam of the type conventionally used, for example, in the construction of buildings is surrounding by cladding boards 1, 2, 3, 4 and 5. The lateral boards 2 and 3 are supported along the length of the beam by means of fillets 6 spaced at regular intervals within the channel 7 defined by the upper 8 and lower 9 flanges of the I-beam. Typically, the fillets 6 are spaced at 300-600 mm intervals

along the channel 7. The cladding boards comprise an inner layer 10 of Rockwool slab of conventional form, except that the slab may be substantially thinner than slabs commonly used in steel cladding operations. Bonded to the outer surface of slab 10 is a layer of intumescent material 11 comprising exfoliating graphite and ceramic fibres bonded together with a polymeric binder such as a polyacrylate. Bonded to the inner surface of layer 10 is a second intumescent layer 12 which also comprises an intumescent substance such as sodium silicate and an adhesive polymeric binder substance, for example an acrylate polymer and/or a urea-formaldehyde resin. Layer 12 is applied as a liquid coat and serves to adhere the layer 10 to the steel surfaces of the I-beam. Fillets 6 are similarly bonded to the inner surface of the flanges 8 and 9 of the I-beam by means of an intumescent adhesive similar or identical in composition to the layer 12. Thus, the I-beam is wholly enclosed within a casing which has both thermally insulating and intumescent properties. It has been found that a beam thus clad, and fire tested in accordance with British Standard 476 for a period of $1^1/_2$ hours imparts excellent fire resistance to the steel beam, and it was found that at temperatures of 550^0C over room temperature, the steel I-beam did not bend or buckle.

In order to give clad steel structural members greater visual appeal, a decorative coating or finish layer may be applied to the surface of the intumescent layer.

It will readily be apparent that numerous alterations

and modifications can be made to the embodiment specifically illustrated in the drawings and described above, and all such modifications and alterations are within the scope of this application.

CLAIMS

1. A cladding board for cladding structural steel members, the cladding board comprising a layer of thermally insulating fire-resistant board material sandwiched between two layers of intumescent material.

2. A cladding board according to Claim 1 wherein the thermally insulating fire-resistant board material is a ceramic board, or board or slab material formed from rockwool or similar man-made mineral fibres.

3. A cladding board according to Claim 1 or Claim 2 wherein the intumescent material is in the form of an intumescent strip material bonded to the thermally insulating fire-resistant board material, or is in the form of an intumescent coating which is applied to the board material in liquid form.

4. A cladding board according to any one of the preceding Claims wherein the intumescent material is formed of an intumescent substance such as an alkaline metal silicate or exfoliating graphite.

5. A cladding board according to any one of the preceding Claims wherein the layer of intumescent material on one side of the thermally insulating fire-resistant board material is formulated to function as an

adhesive, by which the cladding material is secured to the steel beam, without the need for additional mechanical fixings.

6. A cladding board according to Claim 1 wherein the adhesive layer contains an adhesive resin or mixture of adhesive resins.

7. A structural steel member fitted with a fire-resistant covering, the fire-resistant covering comprising an intumescent adhesive layer bonding the covering to the steel, a fire-resistant thermally insulating material bonded on one side thereof to the intumescent adhesive layer, the thermally insulating material having bonded to an outer surface thereof a layer of intumescent material.

8. A method for protecting a steel structural member, which method comprises securing to the said steel structural member a cladding board comprising a layer of thermally insulating fire-resistant board material sandwiched between two layers of intumescent material, wherein one of said two layers of intumescent material is an adhesive layer for adhering the cladding board to the structural member.

9. A cladding board for cladding structural steel members, substantially as described herein with

reference to the accompanying drawings.

10. A structural steel member fitted with a fire-resistant covering, substantially as described herein with reference to the accompanying drawings.

11. A method for protecting a steel structural member, substantially as described herein with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search report) -10-

Application number
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Relevant Technical Fields

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(ii) Int Cl (Ed.5) B23B 7/02, 9/00, E04B 1/94, E04C 2/24, 2/26

Search Examiner
R J Mirams

Date of completion of Search
18 May 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES : WPI, CLAIMS

Documents considered relevant following a search in respect of Claims :-
1 to 11

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
E,A	GB 2269548 A	(PILKINGTON) whole document	1,2,3, 4,8
X	GB 2203157 A	(CROMPTON) eg page 9 line 16 to page 10 line 5	1,2,3,5,6
X	GB 1477658 A	(I C I) whole document	1,3,4
X	EP 0036616 A1	(TAKEDA) whole document	1,3,4

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